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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

REACTOR FUELS SUBCOMMITTEE

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THURSDAY, DECEMBER 16, 2004

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. Dana A. Powers, Chairman, presiding.

COMMITTEE MEMBERS:

DANA A. POWERS	Chairman
MICHAEL T. RYAN	ACNW Chairman
MARIO V. BONACA	Member
ALLEN G. CROFF	ACNW Member
RICHARD S. DENNING	Member
F. PETER FORD	Member
STEPHEN L. ROSEN	Member
VICTOR H. RANSOM	Member
JOHN B. SIEBER	Member
GRAHAM B. WALLIS	Member
RUTH WEINER	ACNW Member

ACRS STAFF PRESENT:

MAGGALEAN WESTON

ALSO PRESENT:

DAVID BROWN

STU MAGRUDER

REX WESCOTT

I-N-D-E-X

M-O-R-N-I-N-G S-E-S-S-I-O-N

8:31 a.m.

CHAIRMAN POWERS: Let's come into session. This is the second day of the Subcommittee meeting for the Subcommittee on Reactor Fuels and we're, of course, discussing the proposed MOX Fuel Fabrication Facility. We have on our agenda a discussion of open items related to Criticality Safety. Unfortunately, our speaker has come down with bronchitis. It seems unlikely that he will be able to review this material with us.

He had ***been kind enough to provide us his view graphs. An examination of those view graphs shows that they are sufficiently arcane that they are not easily gone through. So what I'm going to ask is if Dave Brown will give us first of all just acquaint us with what the criticality issues were at our previous meeting, what the status is now and not attempt to go through all the technical details. We will chase that down at another time and move on with our own business. So, Dave, tell us what you can and don't lead us astray. Okay?***

MR. BROWN: We'll try not to lead you astray. What I'll do is try to just summarize as you say where we were last time, where we are now. On the

second slide of this presentation, what the areas of applicability are (AOA) are areas where the design applications are distinctly different. In other words, in one area of applicability we have design applications in the MOX plant with plutonium nitrate solutions and then another area where we may have plutonium dioxide powder handling. A third would be mixed oxide (MO) powder handling and so on all the way up to fuel assembling handling. So the computer codes that are used to model those situations are verified and validated within those areas of applicability.

One of the important components of that is, of course, what is the set of available benchmark experiments that can support that kind of validation. As of last year, we still had open items on two of those areas of applicability for plutonium powders and for MOX powders. We did close both of those items as I've indicated here on the third slide. We determined for mixed oxide powders that there were only sufficient benchmark experiments to support the use of a subcritical limit with an additional one percent non-parametric margin. I mentioned that briefly yesterday. That's AOA(4).

MEMBER RYAN: Why do you use the word "non-parametric"? Why don't you just say "margin"?

What does that mean?

MR. BROWN: Well, the parametric and non-parametric refers to the distribution of results whether nominally distributed or not. I'm at the limits of my understanding of that concept, but that's fundamentally where the word comes from.

CHAIRMAN POWERS: Basically, you assume a distribution for the parametric cases and for the non-parametric, you don't assume a distribution. Isn't that correct?

MR. BROWN: Well, I think set as I understand it, and again at this point, I'm going to say I'm almost speculating, that the set is tested for whether there is a normal distribution. Failing that test, then a non-parametric margin is applied.

CHAIRMAN POWERS: That's right.

MR. BROWN: Okay. The method that we're applying here, all of these tests and the methodology, is in a technical report, the NUREG/CR-6698 and those are the methods that were applied in order to determine what margins are appropriate. This slide five, the summary there is that there were 49 applicable benchmark experiments to support the validation and so that there was no additional non-parametric margin applied to the k-effective limit

there. But it was, again going into more detail, slide six, for the reasons stated, there is additional margin applied to AOA(4).

I will not attempt to go through slides seven and eight. I think there is some additional explanation of what was done to support our conclusion with regard to AOA(3) and (4).

MEMBER WALLIS: Well, seven looks pretty fantastic. I don't think we need to go into it.

MR. BROWN: Okay. Do you have a question?

MEMBER WALLIS: No, I'm just intrigued with the spikes.

MR. MAGRUDER: Dave, let me jump in. This is Stu Magruder from the Staff here.

MR. BROWN: Yes.

MR. MAGRUDER: I just wanted to say that if there are some technical questions we'd be happy to take them down and provide you a written response to the questions. We've already said we apologize that Chris is not able to sit in today. We'll be happy to do that.

CHAIRMAN POWERS: Stu, what our plans are is first of all I'm going to ask Jack Sieber to take the lead on this particular area. We do have a consultant looking at the area. Once we've gotten

that information and Jack's had a chance to look at all the stuff, we will look at where we stand on that and either provide you some questions that we think can be answered in a phone call or in writing.

MR. BROWN: Okay.

CHAIRMAN POWERS: Or we have an opportunity perhaps to get together immediately toward the end of January for it, I'm sure. It depends on how many other questions emerge. As I explained yesterday, the members have had limited time to review all this material. Many of them have seen the material before, but we're really pulling it all together now. So if enough questions emerge, we may try to get together prior to the February meeting of the ACRS if we think things need to be clarified.

MR. BROWN: Right.

CHAIRMAN POWERS: So there are a couple of ways to recover from this. I don't think we're in desperate shape yet and we'll just keep the lines of communication open for what happens here.

MR. MAGRUDER: Okay. Good. Thank you.

MR. BROWN: I would like to bring your attention to the last slide of that presentation. One of the things we did in order to draw our conclusion was to use a certain code, a module, of the SCALE 5

code. We drew some of our conclusions based on the use of that code. That code was not available to the applicant at the time we were using it. We gave ourselves some assurance that some of the assumptions the applicant had made were correct. But we now feel while that's okay, we would like to be sure that applicant in this case has that as part of their documented safety case on their side, in other words, that they do use analyses to back up some of the assumptions that they have made.

So while we have drawn the conclusion in the SER that it's okay to approve construction based on the Staff's evaluation, we're working with the applicant at this point to see if they can include some of these additional calculations and justifications in their safety case even before we issue this final SER in February. While we had some 13 follow-on areas as we've described here, that perhaps by February 2005 there would only be a few areas where the applicant would still be working on some additional justifications or calculations to support their assumptions.

MEMBER WALLIS: Do you still believe the statement on page 602 "the criticality of safety is based on skill of the craft independent, requires an

intuitive understanding of neutron physics."

MR. BROWN: I agreed that that is a component of certainly an expert criticality of safety.

MEMBER WALLIS: There must be something more than that. There must be something better.

MR. BROWN: It is that and much more.

MEMBER WALLIS: It must be rules. Right.

MR. BROWN: I agree. I would like to go back to your question about the nexus between fire safety and criticality safety if this is an appropriate time to do that. Rex Wescott has agreed to come back and maybe go through that a little bit with us. Is that okay?

CHAIRMAN POWERS: That's fine. Let me just cover a couple of things in criticality safety.

MR. BROWN: Okay.

CHAIRMAN POWERS: Now my understanding is that the applicant will continue to, is committed to follow the double contingency principle.

MR. BROWN: Yes, a requirement.

CHAIRMAN POWERS: Okay. Any other questions particularly on criticality safety to the extent that we can go through it here? I think we have a strategy on criticality safety. Now let's go

to the cross issue of fire protection and criticality safety and particularly the issue of water moderation.

MR. BROWN: Okay. Rex.

MR. WESCOTT: Good morning. I don't completely understand the question at this point. I would be happy to give you a couple quick words about fire protection at the MOX plant. Of course, the fires protection as reviewed by NRC is primarily for the purpose of meeting the performance requirements of Part 70.

At the same time, we have an MOU with OSHA. So we're also interested in the worker safety aspects of fire protection, in other words, making sure that escape routes are proper, that it meets the life safety code and that type of thing. But our main emphasis is on meeting the performance requirements in regard to releases of radioactivity and chemicals that are regulated under 70.61.

The plant is basically designed so that suppression is really a defense-in-depth aspect. I think almost all the fire areas, fire is designed that the fire would be contained in these areas through a mixture of combustible loading controls and the design of the fire barrier itself meeting at least a two-hour fire barrier, in some places possibly even more as far

as the actual fire resistance rating is concerned.

What that basically means is that if there was a fire in there and the suppression system failed the fire would still not result in a release that was exceeding the performance requirements. You might have a lot of property damage. You might hold your mission up for a number of months, but you'd basically still be within your safety limits. I'm not sure if I'm answering your concerns.

CHAIRMAN POWERS: The question really is then where you've selected to use clean-agent fire suppressants. The question is are they going to put the fire out.

MR. WESCOTT: Well, there's not a 100 percent certainty anymore than there is with a sprinkler system. Of course, as a fire protection engineer, I'd probably prefer water, but a case where if these are moderation control areas, we keep water out of them because of criticality controls. So we went to gaseous suppression which we feel has a significantly high enough reliability to work.

Like I said, if it's doesn't work, these are what we call defense-in-depth fire routes. In other words, they're not really accounted for in making the determination the performance requirements

will be held. The performance requirements according to the design will be met without the operation of the suppression systems.

MEMBER WALLIS: Now you said that there might be significant damage, but no releases.

MR. WESCOTT: That's correct.

MEMBER WALLIS: But then there's a question of what do you do with this plant which is significantly damaged and has all these various reactants and things which were going to be reacting and now they are presumably in vessels which have some damage around them. What do you do now? Are you going to restart the plant? Are you going to fossilize it or build a mausoleum or something?

MR. WESCOTT: Well, really for the most part except where there may be a safety aspect, that's kind of a DOE concern as to how they're going to protect their property and get back in operation as soon as possible.

MEMBER WALLIS: That's not your concern.

MR. WESCOTT: Well, as a citizen, it's certainly my concern. As an NRC fire protection engineer, it's kind of outside my authority.

MEMBER WALLIS: Well, if the fire's out and there's no release, then your responsibility

stops.

MR. WESCOTT: Well --

CHAIRMAN POWERS: Pretty much.

MR. WESCOTT: Yes.

CHAIRMAN POWERS: I think that's the answer.

MR. WESCOTT: Yes, that's the answer. As bad as it may sound, that's the answer. Yes.

CHAIRMAN POWERS: Let's come back to the clean agents just a second. I mean we've, Steve and I, have both looked at the San Onofre fire. I think that's the most recent example over and over and over again in which I think they discharged every CO_2 extinguisher they had on the site and all they succeeded in doing was creating a char layer that assured that there was lots of fire and as soon as they opened up the cabinets again, the fire came back on and eventually, what is it, 16 feet up we still had cables being fried and things like that.

MR. WESCOTT: Well, all I can say to that is I think cable insulation is a special case. You're probably much more likely to get a deep-seated fire, I think. Unfortunately Sharon's not here who was a reviewing fire protection engineer, but I think in a lot of the areas where you have glove boxes and so on.

Probably the combustible you might be most concerned with is PMMA which is in there for shielding.

MEMBER RYAN: What's that?

MR. WESCOTT: PMMA.

MEMBER RYAN: Yes.

MR. WESCOTT: Polymerthiculate or whatever.

CHAIRMAN POWERS: Plastic. Polymethylmethacrylate.

MR. WESCOTT: It looks like polycarbonate.

MEMBER RYAN: Okay.

MR. WESCOTT: And that's not very combustible. It's a combustible but you really have to work to get that to go. I don't think just proximity to the PMMA is going to do it, but the PMMA does burn. It burns quite rapidly. It burns quite hot. I think that's going to be the major problem. But still, it's more like a pool fire, more like a hydrocarbon fire. It's not going to give you the deep-seated fire. I mean I would expect the gaseous suppression to deal quite well with the PMMA.

MEMBER RYAN: Could I come back to the point you made about there not being a release?

MR. WESCOTT: Right.

MEMBER RYAN: Would you expand on that?

MR. WESCOTT: Well, it's designed, there are a number of factors. First of all like I said, we don't expect the fire to get out of the compartments in regard to the HEPA filter protection. That's basically protection through dilution.

In other words, you have fires in a couple fire areas. You can get temperatures up to 2,000 degrees Fahrenheit but still the amount of other flow that comes from areas which are not fire protected is enough to keep the temperature at the filters below their ignition temperature or actually below their damage temperature, I should say.

MEMBER RYAN: So even though one of the ventilation streams coming from the glove box or the area that's involved in the fire would be highly contaminated.

MR. WESCOTT: Right.

MEMBER RYAN: And filled with smoke and polymethylmethacrylate fumes or whatever the decomposition products thereof are which I would guess are hydrochloric acid and some other things, nice things like that.

CHAIRMAN POWERS: No. Not much HCl.

MEMBER RYAN: But whatever, it's all going into the HEPA filter system.

MR. WESCOTT: Well, I want to be a little bit careful because they have the option. I think they are putting manually controlled dampers on the glove boxes right now. So they're going to have probably the option of shutting off the exhaust or leaving it on. So what they do with a glove box is probably I don't think decided yet. I think they are going to work that out as they get farther in the design as to how they're going to handle it for a particular fire.

MEMBER RYAN: Well, the question though getting to a manual damper would be interesting if that area was involved in the fire.

MR. WESCOTT: Right.

MEMBER RYAN: You wouldn't be able to get at the damper probably.

MR. WESCOTT: Well, I assume these are going to be remote controlled.

MEMBER RYAN: I thought you said "manual dampers."

MR. WESCOTT: Well, by an automatic damper, I mean one that's going to be temperature controlled. In other words, when the room temperature reaches a certain amount, the damper is going to close. When I say "manual," I mean somebody someplace

is going to have control of it whether it be in the control room or whether it be in an area that's maybe closer than the control room. But it's not just going to go shut and stay shut.

MEMBER RYAN: I think the central piece of your argument is that deep-seated fire is not likely.

MR. WESCOTT: Yes.

MEMBER RYAN: Because a deep-seated fire, you really do have to cool it off before you let oxygen back in. Otherwise what we found is the same intervention at San Onofre, you can have a reflash. But even more disturbing is some recent evidence that if you leave a deep-seated fire in place in a closed area where there are lots of cable insulation and other things, you can create a detonable mixture. You can have detonation not just deflagration when you reenter when you let oxygen back in.

This is a real concern in terms of being able bound the extent of the subsequent fire and causality. My view of this is that I understand that there's a tension here between criticality safety and fire but that more could be done other than simply saying we're going to let criticality safety be predominant. For example, one could say, "Yes, criticality safety is predominant and we're not going

to put water in this thing, but we'll have a way of getting water to this area, a dry pipe or something like that, that firefighters could later on say, "We have simply to get this fire out, cool it off" and there's not enough inventory in there to go critical. We know that now. So they could make some judgments.

MR. WESCOTT: To the best of my understanding, that is the case. There will be stand pipes. There will be, I think, the crew would be equipped with hoses, the fire brigade, and I think one and a half inch hoses with spray nozzles. It's my understanding that they won't use solid-stream nozzles in the plant.

Of course, that's another criticality concern. You don't want to upset geometry controls on materials anymore than you want to add a moderator. But it's my understanding that they, the fire brigade, will be able to put water on areas and they will be able to do it with spray nozzles. I think that concern would be handled by the fire brigade.

But you're absolutely right as far as the gases. I think what you're referring to is something that is called a "back draft condition" when you have gases that are heated above their ignition temperature, but you're also above the upper flammable

limit as far as concentration goes. Then you add air and of course, it's able to combust your detonator or deflagrator or whatever the situation is with it.

MEMBER RYAN: Yes.

MR. WESCOTT: But that's certainly a concern. Those types of things based on materials are the kinds of things we try to work with the pre-fire plans. That's usually done right before operation as opposed to back at this stage. You look at the materials in your room and –

MEMBER RYAN: But I agree. The pre-fire plan is very important, but you have to have the connections and the limited amount of hardware there. It's not just the question of taking the hose up. It's the question of having a place where you can perhaps screw in a hose, they could quick connect and spray through the dry action sprinklers or deliver water to an area that's remote from another area. That kind of thinking needs to be done up front in my view even in areas where moderation control is important.

MR. WESCOTT: Yes, to my knowledge I don't believe there's any dry system or something that could be activated remotely. Again, that's more of a detail question for Sharon.

MEMBER RYAN: That's an ISA question you would say?

MR. WESCOTT: Well --

MR. BROWN: I don't think so. One of the things that Rex pointed out and I just want to reemphasize is when we're looking at the fire barriers in this facility which are two-hour and three-hour fire barriers what DCS did is looked at what is the combustible load in the room that would challenge that fire barrier. So while they certainly have provided for putting the fire out with fire suppression, the barriers are designed to withstand the full combustible load.

MEMBER RYAN: I'm not questioning the integrity of the barriers.

MR. WESCOTT: Right.

MR. BROWN: But I think you are questioning whether they're going to be able to suppress this fire and what we're saying is that the confinement and containment of that fire will be sufficient to provide for safety. The HEPA filters will withstand the full soot load and the high temperature to the completion of that fire. No doubt that will be a tremendous problem for DCS in terms of operations, but our focus is on material confinement

and they've shown that they can do that.

MR. WESCOTT: Yes, one thing I would like to say to backtrack a little bit to Dr. Rosen's concern is I think the possibility of explosion in a room because of the deep-seated fire and build up of gases is certainly a great danger to the personnel particularly that firefighting personnel that might go in there later. But in regard to actual danger to the plant, I guess it would have to be looked at, but these are walls of substantial construction, reinforced concrete and so on and I would tend to expect that unless you really had a tremendous detonation of some type in there, one that normally doesn't occur just from overheated gases and so on, that it should be a problem to plant safety.

MEMBER RYAN: My concern is that the detonation that occurs that it damages the ventilation system as well. It's not a concern –

MR. WESCOTT: Pressure wave up this.

MEMBER RYAN: Yes, not for the walls themselves necessarily.

MR. WESCOTT: Yes. I don't believe that was ever to my knowledge a design-basis sequence in that.

MEMBER RYAN: Well, it may be. One of our

jobs is to try to probe into areas where that may be ought to be design-basis.

MR. WESCOTT: It might be a question for DCS.

MR. BROWN: And certainly the filter assembly are designed to 10 inches of over-pressure. I don't know if this would be a fast over-pressure.

MEMBER RYAN: We're not talking about entrance of over-pressure.

MR. BROWN: Keeping in mind if this would come from one area and there are 350 fire areas in the plant, this would be going into a common manifold prior to hitting any final filters. A lot of effects of what's happening in the one fire area, over-pressure, soot loading, temperature, are mitigated before they reach the final assemblies.

MR. WESCOTT: Right. If you have a deflagration, basically you're going to get an increase in pressure probably four or five times over atmospheric and when you look at that as just one area as compared to hundreds of areas that are all feeding into the system, it probably would, I would suspect, only increase the pressure in the filter by a very small amount.

MEMBER WALLIS: Can I ask you about these

plastic and PMMA, polymethylmethacrylate, it's plexiglass essentially?

MR. WESCOTT: Right. Plexiglass.

MEMBER WALLIS: On page 6023, there's some mention of polystyrene. I can't imagine why it's there, but there is some mention of polystyrene, too.

MR. WESCOTT: That would be a combustible, too.

MEMBER WALLIS: That would be a combustible. Not only they burn, but when they get hot enough, they soften and they flow.

MR. WESCOTT: That's correct.

MEMBER WALLIS: So they flow around some, they are pretty good moderators, too. They flow around some plutonium and then you have to worry about criticality induced by the flow of the plastic creating a reflector or moderator and so on. I assume this is all considered, but it's not just a question of the burning of these plastics. It's the changing of their geometry in some way.

MR. WESCOTT: No. I don't know if that's been considered or not.

MEMBER WALLIS: Well, it must have been surely.

MR. BROWN: Generally, especially if it's

geometrically-safe equipment, there was an assumption of full reflection provided by a hypothetical water jacket or something. So that would encompass this possibility.

MEMBER WALLIS: So that's an assumption then.

MR. BROWN: As part of, right, the safe design of the equipment for geometry.

MR. WESCOTT: And of course, once again you have to assume the failure in the suppression system to get to that state. Because as soon as it start flaming your suppression system, it's expected to go off and should stop the fire right there.

CHAIRMAN POWERS: Any other questions on this subject? Let me ask you one question, a little general philosophical question on the design of this system. Actually, I have two philosophical design questions. It seems to me that we have set a classic nested design here and then the flow comes through a single HVAC system. Is that correct?

MR. BROWN: The areas where there are dispersible material is what we call "the C4 area." It's the innermost of this tertiary confinement system.

CHAIRMAN POWERS: Right.

***MR. BROWN:** That goes through one set of online HEPA filters essentially in one housing. That's right. Upon failure of a glove box though, beyond the state of design-basis breach, the secondary confinement system is what we call C3 which covers all of the process rooms where there are glove boxes. That's a much larger set of filters. I think more than 150 HEPA filters that support that area and several blowers and that sort of thing.*

Then beyond that is the C2 confinement system which covers the hallways and corridors and accessible spaces around process rooms. That's where we get and of course, that is HEPA filtered at the outlet as well.

***MEMBER WALLIS:** This is the way that the plant was designed I think that we visited in France. They gave us a presentation that talked a lot about this tertiary confinement. I assume this is the same thing because it's called the same.*

***MR. BROWN:** It is the same philosophy. C1 of course is spaces that can be open to the outdoors like truck base just to finish that up.*

***CHAIRMAN POWERS:** That's good. Let me come back also to this question of for some reason the process systems particularly the centering furnaces*

and the aqueous polishing lines have to be promptly stopped and we can argue what "promptly" means or discuss what "promptly" means, but immediately and that stoppage is for weeks. Have we looked at the consequences of that?

MR. BROWN: Certainly some of the design basis we talked about yesterday were to address that very situation. For red oil phenomena and for the HAN/hydrazine phenomena, some of the safety functions of the safety controllers is to monitor the duration of that stoppage if you will or it's actually to monitor the total contact time during normal operations and during any stoppages.

For example for the solvent to ensure that there's no build-up of degradation products that could lead to the red oil explosion or to flammable offgases, for the HAN prevention, the Department of Energy's experience has been just that, that they left the facility in an improperly deactivated state that should have been taken to a full complete safe condition. So we have in the case of the HAN explosion a commitment from DCS that they will not leave solutions of hydroxylamine nitrate and hydrazine for long periods of time.

As a practical matter, you could ask,

"What then would they do?" They do have provisions at the tailend of that part of the process for an oxidation column. They have an oxidation column which serves the purpose of destroying hydroxylamine nitrate and hydrazine. So what I could further speculate that safe shutdown of this plant would probably mean at least taking the process that far which is to ensure the solvent is clean and to ensure that any residual hydroxylamine nitrate and hydrazine has been destroyed. I'm going beyond what we know for the construction approval speculating on how the plant could be brought to a safe shutdown.

CHAIRMAN POWERS: Dave, you'll be coming in, though the point is that in your examination there is nothing inherent in the design that's inamicable for that kind of operating philosophy.

MR. BROWN: There's nothing I'm aware of that prevents this plant from being brought to a safe shutdown almost automatically.

CHAIRMAN POWERS: Okay.

MEMBER WALLIS: And staying safe.

MR. BROWN: I'm sorry?

MEMBER WALLIS: And staying safe.

MR. BROWN: And staying safe. Right.

MEMBER WALLIS: For a period of weeks.

MR. BROWN: Correct.

MEMBER DENNING: Dana?

CHAIRMAN POWERS: Yes sir.

MEMBER DENNING: Could we pursue this emergency planning part and I wasn't thinking so much offsite questions. But it wasn't obvious to me yesterday and I don't know that much about how chemical plants are handled. Are there advanced plans for what happens if you get into some of sort of off-normal condition? How do you bring the plant to a safe, stable condition and are there operators that are trained in the use of these procedures and they know just what to do and this kind of stuff?

MR. BROWN: I only hesitate because this is going to sound very familiar. The emergency planning, something that DCS is working on now, the NRC has not received yet. They have committed to onsite emergency response capability and we know that the plan has certain features that are consistent with good planning for emergency response like the provision for safe havens for workers to escape to that have separate ventilation systems that include chemical hazard removal cartridges, that sort of thing to provide a habitable safe place for workers to be.

The details of which operators during

which situations will be required to go to the emergency control room for example to monitor the plant's automatic safe shutdown, we don't know at this point. They certainly are going to provide for that and some of that were it to be an emergency that DCS were to require offsite assistance, they are making those arrangements as well.

I know that they are working on an annex to the site-wide emergency plan that would allow for DCS to call for support from the onsite fire response organizations from the Savannah River security forces if they need it, that sort of thing. But I think getting back to your question, the details of who will do what when, we don't have at this point. That's something we would expect with the license application.

CHAIRMAN POWERS: Now I want to --

MEMBER RYAN: Could I just follow up one second?

CHAIRMAN POWERS: Please.

MEMBER RYAN: I'm reminded of the picture we were shown yesterday of the nitrogen tetroxide cloud and thinking about egress routes for operators. We just went through on the reactor side quite a lot of discussion about credit for operator manual actions

post fire and the Commission is now considering certain proposals in that regard. In part of that discussion, there was a lot of talking about how operators would get from where they were to where they needed to be to take these manual actions including discussions of formulation of time lines, how long it would take and therefore how they would go from point A to point B.

Is that kind of analysis and thinking that you're suggesting to us will be done at the time that the emergency plans and pre-fire plans are available? Are you actually thinking about making those kinds of analyses to show that an operator given a given circumstance in a position can make an egress through an area perhaps with nitrogen tetroxide atmosphere at some concentration into the safe haven?

MR. BROWN: Sure. Our evaluation again with the license application would be to evaluate their onsite emergency response. What are they going to be capable of doing? Then that was certainly included with what I'll call these "time-motion studies."

If someone is way over here and there are several security barriers and closed doors and other features, are they really going to be able to make it

to a safe haven? For example, again to speculate, if there were only one safe haven on one side of the plant, I think it would be reasonable to be concerned that perhaps not everybody could get there.

MEMBER RYAN: Well, it's a five level plant, right, or six levels?

MR. BROWN: Several levels, right.

MEMBER RYAN: So it's not just one dimension.

MR. BROWN: That's true. That's right. I think there are perhaps in the aqueous polishing process. I think there are only three with some mezzanine levels in the powder process. But nonetheless, you possibly do have to go down and then out to get into one of these areas. We'll have to evaluate whether that's --

MEMBER RYAN: I would remind you that the Agency has a regulatory guide that was created in the discussion of credit for manual actions in reactors post fire.

MR. BROWN: Okay.

MEMBER RYAN: That lays out how to do this analysis and the fact that you need to consider stress on the operators. Obviously, these people will be concerned for their own life safety. The plant

itself. The conditions, lighting, etc. The degree of proceduralization that they have. The degree of training in those procedures. All those things are in the reg guides. So I commend it to you for your review.

MR. BROWN: Okay. That's something. Can you tell me what reg guide that is?

MEMBER RYAN: Not offhand, but I'm sure Marvin Sykes of our staff can tell you.

MR. BROWN: Okay. I certainly would want to be aware of that while we're doing that review.

MEMBER RYAN: You have the number.

CHAIRMAN POWERS: Any questions? I mean we're ranging far and wide. What I'd like to come back to is the red oil and HAN issues I think just a little bit. In the course of the presentations that were made yesterday, they showed the various regions where red oil excursions could occur. The question that I really have is what magnitude of inventory would be involved in those, not the inventory of the red oil, but the inventory of radioactive material.

MR. BROWN: Well, let me start this way. My understanding of the closed system which is the system where I think we expressed we had the most concern, that is a system that could not relieve the

overpressures created by a red oil reaction, that's the system that's closed is the acidic recovery evaporator. This is an evaporator essentially at the end of the process that treats the raffinate from the PUREX process which has been stripped of uranium and plutonium and so it does contain residual amounts, that aqueous phase that's being evaporated, of uranium and plutonium, but not the full load that was at the front end. Any solvent which would get into that part of the process also during normal operations would have been unloaded, would have been stripped. So it contains residual quantities.

What does that mean in terms of gross quantities? I think it could mean anywhere from tens to several hundreds of grams of plutonium just to speculate as a worst case scenario, but not the inventory of plutonium one would envision if, for example, I were to take dissolved plutonium nitrate from the electrolyzer and dump it right into the evaporator. That would be a far off-normal condition.

However, one of the things that's kind of different about the new Part 70, and I say different from say the Department of Energy has done things in the past for example, is we also have to provide protection for the worker and with plutonium, it's

something like one microgram that is sufficient to exceed our performance requirements for the safety assessment. So it doesn't really take much for the residual level to create a safety concern, but certainly the explosion does not involve the kinds of quantities that we see elsewhere in the plant.

CHAIRMAN POWERS: And the same question with respect to the HAN events. Are there any of them that take place that can potentially take place in the areas of high inventory?

MR. BROWN: Yes. Where the HAN explosion that could occur is in areas where plutonium is being stripped from the, what I think has been coined "the pregnant organic phase" if you will.

CHAIRMAN POWERS: Yes.

MR. BROWN: So there could be significant quantities of plutonium present in areas where there's a HAN explosion risk.

CHAIRMAN POWERS: Good. I just wanted to get it on the record. Okay. Any other questions? Thank you very much and we will try to repay on the criticality once we're better prepared and your speaker is healthy.

MR. BROWN: Okay.

CHAIRMAN POWERS: And we can go off the

record at this point and move into our discussion session.

MR. BROWN: Thank you.

CHAIRMAN POWERS: Thank you.

MEMBER: Before you run away, would this be the right time to take a break?

CHAIRMAN POWERS: It probably would be. Why don't we take a break until 9:30 a.m. Off the record.

(Whereupon, the foregoing matter went off the record at 9:14 a.m.)